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Simulink Fundamentals

Training Objectives

This course (formerly known as *Simulink for System and Algorithm Modeling*) is for engineers new to system and algorithm modeling in Simulink®. It teaches attendees how to apply basic modeling techniques and tools to develop Simulink block diagrams. Topics include:

- Creating and modifying Simulink models and simulating system dynamics
- Modeling continuous-time, discrete-time, and hybrid systems
- Modifying solver settings for simulation accuracy and speed
- Building hierarchy into a Simulink model
- Creating reusable model components using subsystems, libraries, subsystem references, and model references

If your application is signal processing or communications, please refer to the *Signal Processing with Simulink* course.

Prerequisites

MATLAB Fundamentals

Products

- Simulink

Course Outline

Day 1 of 2

Creating and Simulating a Model (1.5 hrs)

Objective: Create a simple Simulink model, simulate it, and analyze the results.

- Introduction to the Simulink interface
- Potentiometer system
- System inputs and outputs
- Simulation and analysis
- Solver behavior
- Algebraic loops

Modeling Programming Constructs (1.5 hrs)

Objective: Model and simulate basic programming constructs in Simulink.

- Comparisons and decision statements
- Actuator logic system
- Zero crossings

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- MATLAB Function block

Modeling Discrete Systems (2.0 hrs)

Objective: Model and simulate discrete systems in Simulink.

- Discrete signals and states
- PI controller system
- Discrete transfer functions and state-space systems
- Multirate discrete systems

Modeling Continuous Systems (2.0 hrs)

Objective: Model and simulate continuous systems in Simulink.

- Continuous states
- Throttle system
- Physical boundaries
- Continuous transfer functions and state-space systems
- Simulation speed and accuracy

Day 2 of 2

Developing Model Hierarchy (2.25 hrs)

Objective: Use subsystems to combine smaller systems into larger systems.

- Ports and subsystems
- Masks
- Vector and bus signals

Modeling Conditionally Executed Algorithms (1.25 hrs)

Objective: Create subsystems that are executed based on a control signal input.

- Conditionally executed subsystems
- Enabled subsystems
- Triggered subsystems
- Input validation model

Referencing Model Components (2.25 hrs)

Objective: Use referencing to combine subsystems and models.

- Referencing workflows
- Subsystem referencing
- Model referencing
- Root-level inputs and outputs
- Model workspace
- Model reference simulation modes
- Model dependencies

Creating Libraries (1.25 hrs)

Objective: Use libraries to create and distribute custom blocks.

- Creating and populating libraries
- Managing library links
- Adding a library to the Simulink Library Browser

Appendix A: Debugging Simulink® Models

Summary: Step through a Simulink simulation and view signal values interactively.

Appendix B: User Interface Reference

Summary: Provides a reference on working with the Simulink interface, including commonly used keyboard and mouse shortcuts.

Appendix C: Rate Transitions in Multirate Models

Summary: Discuss intricacies of how data transfer is handled between Simulink blocks that update at different rates.

Appendix D: Automating Modeling Tasks

Summary: Automate common modeling and simulation tasks using MATLAB code.

Appendix E: MATLAB® Review

Summary: Review basics of the MATLAB language that are useful when using Simulink.

Appendix F: Solver Selection (2.0 hrs)

Summary: Select a solver that is appropriate for a given Simulink model.

- Solver behavior
- System dynamics
- Discontinuities
- Algebraic loops

Appendix G: Exercises

Summary: Course exercises